When to Say When: Effects of Supply on Usage

VALERIE S. FOLKES
INGRID M. MARTIN
KAMAL GUPTA*

A series of experiments manipulated product supply to investigate the effects on product usage. Subjects were presented with containers filled with various amounts of a product and asked to indicate how much of the product they would use. Consumers tended to conserve diminishing resources so that the amount they indicated they would use generally decreased as the supply decreased. Container size and the fill level of the container did not influence the amount used.

The vast bulk of consumer research investigates either events leading up to the product purchase or the purchase itself. Other stages in consumption, such as usage, receive relatively little attention. One fundamental question regarding usage is how consumers decide the amount of a product to use. A great deal of research has examined in the aggregate how much and how frequently people buy (e.g., Blattberg et al. 1978; Raj, Staelin, and Mitchell 1977); however, little research directly investigates those factors that influence the amount of a product consumed on a single usage occasion. When pouring detergent into the wash, shampooing one's hair, adding coolant to the radiator, and so on, what influences how much of the product the consumer uses?

Judgments about product effectiveness are probably the most important influences on usage. When deciding how much of a product to use, consumers may often determine the amount necessary to achieve the desired effect and then use that same amount for all usage occasions. For example, the consumer might decide that one capful of shampoo applied to one's hair leads to good results and will use that same amount whenever shampooing.

However, there is reason to believe that a factor unrelated to judgments of product effectiveness, the supply on hand, influences the amount consumers use on a single usage occasion. Abundance may influence usage such that consumers use more of a product when the supply is plentiful but less as the supply diminishes. For example, consumers might pour more bleach into the wash when they have a gallon on hand, less when they have only a quart, and even less when they have but a pint.

CONTRAST EFFECTS ON USAGE

Judgments of size are made relative to their context; a 6-foot-tall basketball player appears short in the midst of a National Basketball Association team but appears tall in the midst of a high school basketball team. Similarly, a cup of bleach may seem small compared with a gallon of bleach but large compared with a tablespoon. Further, the stimuli to be judged are often contrasted with the comparison standard so that the judgment becomes even more extreme (Helson 1964; Sherif and Hovland 1961). Thus, consumers may contrast the amount they initially intend to use with the supply on hand and perceive that they are using up more of a product when a small supply is available than when there is a larger supply on hand.

Products can be viewed as resources available to consumers that they are reluctant to give up. To conserve the perceived diminishing resources available to them, consumers may use increasingly less of a product as the supply decreases. Such a tendency probably emerges only within a range of amounts that the consumer deems effective. For example, consumers are unlikely to pour a quart of bleach into the wash even if they have an extremely large supply on hand because a quart is far in excess of the maximum amount likely to lead to a good effect. Thus, a supply effect on usage should have both upper and lower bounds.

*Valerie S. Folkes is associate professor of marketing and Ingrid M. Martin is visiting assistant professor, both in the Department of Marketing, University of Southern California, Los Angeles, CA 90089-1421. Kamal Gupta is project leader in sales-product analysis at Sandoz Pharmaceuticals Corp. The authors appreciate the helpful comments of Eric Johnson, Henrianne Sanft, and Raja Selvam on an earlier version of this manuscript.

PERCEPTIONS OF SCARCE PRODUCTS

Previous research has not examined how a person's supply influences the amount apportioned for an individual usage occasion. Some evidence to support a relationship between supply and usage can be found in a small literature indicating that scarcity increases the value placed on a commodity. Some of these scarcity studies are irrelevant to the hypothesis posited here because they examine product preferences when other consumers are competing for the same commodity (see Lynn [1991] for a review). These studies emphasize the value of acquiring scarce commodities in conveying a sense of uniqueness and superiority over other consumers. In contrast, our interest lies in the effect of having various amounts of a product on hand when there is no competition from other consumers.

Other scarcity studies have found that consumers infer that products available in small quantities cost more and are considered more desirable (Lynn 1989; Worchel, Lee, and Adewole 1975). Supply would influence usage because consumers curb their use of a product as the cost of wasteful behavior increases. For example, a consumer should feel less extravagant when using a cup of bleach if a gallon supply is on hand than when only a pint remains; the gallon supply would be perceived as a less expensive product. In short, as the supply on hand diminishes, the consumer should reduce the amount of product used.

The most relevant scarcity study compared evaluations of cookies when the supply was plentiful (10 cookies) with evaluations when the supply was limited (two cookies; Worchel et al. 1975). After tasting the cookies, subjects thought the cookies cost more, considered the cookies more attractive as a consumer item, and indicated they would like to eat more of the cookies when they were in limited supply than when plentiful. (However, if the subjects had actually eaten more cookies in the two-cookies condition than in the 10-cookies condition, this would be evidence against conserving diminishing resources.)

Further, cookies in limited supply were evaluated even more positively when the ample supply was initially presented to subjects but then withdrawn. The larger supply appears to have served as an anchor for judging the size of the two-cookie supply (see Helson 1964). The discrepancy between the two amounts would make the two-cookie supply seem even smaller compared with that when the large supply was never presented. Manipulating the frame of reference for the supply to create a contrast effect can intensify perceptions of scarcity. In sum, supply might influence usage by (1) enhancing a product's value and attractiveness when scarce compared with when abundant and (2) creating a contrast effect between supply and amount to be used.

CONTAINER EFFECTS

Examining the effect of supply on consumption is complicated by possible container effects; the container and the proportion of product to container may also influence how much is used. For many products a possible frame of reference for one's supply is the container. A box that holds 10 cookies but has only two may have the same effect as the withdrawal of 10 cookies from the subjects' initial supply in the Worchel et al. (1975) study. Thus, a contrast effect may emerge that is more complex than a simple supply effect because the empty space in the container is considered.

It may be that the greater the discrepancy between the container's potential fill level and the actual fill level, the greater the perceived scarcity of the product. For example, a half-filled 16-ounce bottle of bleach (an 8-ounce supply) would appear to contain a smaller supply than a full 8-ounce bottle, and, as a consequence of being perceived as less, would be used more sparingly. In sum, an alternative hypothesis to a simple supply effect is that, as the ratio of container size to supply increases, the perceived supply seems smaller, so the amount used decreases.

A third possibility is that the container size itself might be used as a cue for product effectiveness and so influence usage. Experience with products may have taught consumers that large bottles generally contain weaker or more diluted forms of products, whereas small bottles contain more concentrated forms. If so, then consumers might use less from small containers because the product within the small container would be perceived as more effective compared with that in a large container.

OVERVIEW OF THE RESEARCH

The effects of an individual's supply, the container, and the fill level have not been explored previously, so the series of experiments presented here is primarily concerned with documenting the effect of supply on usage. Five experiments manipulated product supply and examined the amount consumers indicated they would use. Various supplies were tested in the experiments because there might be both upper and lower boundaries on the relationship between supply and amount used. Study 1 disentangled supply and container effects, while the remaining studies examined only supply effects.

The research also attempted to shed some light on the process involved in determining usage. The contrast explanation implies that reduced usage occurs when assessing the supply (e.g., viewing the container) rather than as depletion occurs (e.g., in the act of pouring bleach into the wash). Thus, one study tests the effect by permitting only visual assessment of supply, while another study precludes visual assessment by using opaque containers. The primary alternative explanation

for usage effects (the assumption that scarce products are valued more) is considered by examining consumer perceptions of various supplies in study 4, as well as by comparing the amounts poured for various supplies on hand. Finally, some evidence that large amounts are not perceived as weaker or less potent than smaller amounts (as might hold true if smaller amounts were associated with more concentrated formulas) is presented in studies 1 and 4.

The methodologies used to examine effects of supply on usage were systematically varied to increase confidence in the generality of the results. One model guiding the choice of variables to attend to when testing for generalizability is that proposed by Jenkins (1979). According to his tetrahedral model, four variables should be considered: types of subjects, materials to be tested, the type of test employed, and the research setting. Consistent with this model, studies 1–3 differ from studies 4 and 5 on each of these dimensions, and study 4 differs from study 5 on some dimensions.

Although the methodologies in these studies differed from each other in many respects, a general commonality is that consumers were asked how much of a product they would use in a familiar usage situation. The alternative of testing this hypothesis in a naturalistic context in which household stocks are monitored periodically was rejected because confounds are present in the natural environment. Vessel size may affect the frequency of product usage. Large containers are more likely to attract attention and so remind the consumer to use the product. When one opens the freezer, a quart package of ice cream is more noticeable than a pint; when one opens a cupboard, a gallon bottle of bleach is more noticeable than a quart. Thus, container size might influence amount used for reasons other than those proposed here. Further, transaction costs and overlapping replenishment of supplies are likely to introduce extraneous considerations. For example, an additional container of the product might be purchased before the previous container was empty.

STUDY 1

An experiment was conducted to investigate whether the supply of the product, the container, and the fill level of the container influence the amount of a product consumers use.

Method

A convenience sample of clerical employees of a West Coast urban university were recruited with only one person per office participating in the experiment. Potential subjects were asked to take part in a study about toilet cleaners. Of the 85 persons approached, five did not have the time and five claimed never to have cleaned a toilet. This left a total sample of 75 persons (57 females and 18 males) who had cleaning experience and so could report the quantities of cleaner they would use.

Procedure. Each person was shown a transparent, unlabeled plastic bottle containing a blue liquid described as a toilet bowl cleaner. The bottle used did not, in fact, contain toilet bowl cleaner and did not resemble the container of a particular brand of bowl cleaner. A toilet bowl cleaner was used because many people have experience using this very common household product.

Subjects were asked to pour the amount they would use for cleaning the toilet bowl into a 1,500-milliliter receptacle. Most subjects reenacted the toilet cleaning task by pouring the liquid around the edges of the receptacle, just as they would when cleaning. The quantity was then measured. The liquid was offered to subjects in one of two bottle sizes, with the smaller bottle having half the capacity of the larger bottle (500 milliliters vs. 1,000 milliliters). Although of different sizes, the bottle shapes were identical.

Supply available was varied by filling the container either half-full or full, so that the small bottle held either 250 milliliters or 500 milliliters of the liquid and the large bottle held either 500 milliliters or 1,000 milliliters of the liquid. To aid in distinguishing effects of bottle size from the amount in the container, the large bottle was also filled to one-fourth full (250 milliliters). Thus, the quantity of liquid in the quarter-filled, large-bottle condition was the same as in the half-filled, small-bottle condition (250 milliliters). Both bottle size and amount of liquid were manipulated between subjects. With 15 subjects per cell, the five conditions (full large bottle, half-filled large bottle, quarter-filled large bottle, full small bottle, and half-filled small bottle) were randomized across subjects.

Perceptions of Potency. Small containers may be associated with more concentrated forms of product and so could influence usage. To provide some assurance that various amounts would be perceived as equally potent, a separate group of subjects viewed the bottles but were not given the pouring task. Subjects were 34 business school students with an average age of 26. One subject was deleted from the sample because he had not cleaned a toilet bowl, leaving 33 subjects (18 male, 15 female).

Similar procedures as in the usage study were followed except they were asked to indicate on a rating scale the "cleaning power of the product." The nine-point scale was anchored by "very weak cleaning power" and "very strong cleaning power." The supply was manipulated by presenting to subjects either a full large bottle (1,000 milliliters, $n = 18$) or a full small bottle (500 milliliters, $n = 15$). Regardless of the supply, subjects rated the products as equally strong ($\bar{X} = 4.6$ for the large vs. 4.9 for the small supply).

Results

Only product supply influenced usage, with subjects pouring more liquid when they had a lot or a little (see Table 1). This is clear from the two ANOVAs that were

TABLE 1

MEAN AMOUNT POURED IN STUDIES 1–3

	Supply (milliliters)	Amount poured (milliliters)	Percentage poured	SD
Study 1 conditions:				
Full large bottle	1000	146	15	69.1
Full small bottle	500	87	17	36.7
Half-full large bottle	500	97	19	36.0
Half-full small bottle	250	136	54	54.5
Quarter-full large bottle	250	121	48	52.2
Study 2 conditions:				
Two-thirds-full bottle	667	132	20	37.9
One-third-full bottle	333	85	25	31.8
Study 3 conditions:				
Two-thirds-full large bottle	667	113	17	69.2
One-third-full large bottle	333	104	31	53.5
Two-thirds-full small bottle	333	97	29	41.9

conducted, each using only four of the five conditions. In the first analysis, container size was one factor (1,000 milliliters vs. 500 milliliters) and fill level was the second factor (half vs. full). (The quarter-full large bottle was not included in this analysis.) A significant container-size by fill-level interaction indicated that more liquid was poured when the large bottle was full and when the small bottle was half-full ($F(1,56) = 13.64$, $p < .001$, $\eta = 0.44$).

The full, large-bottle condition was not included in the second ANOVA. Container size (1,000 milliliters and 500 milliliters) and volume of liquid (500 milliliters vs. 250 milliliters) were the two factors. There was a significant main effect for volume of liquid, with *more* liquid used when the bottle contained a smaller amount ($F(1,56) = 5.21$, $p < .01$). The effect size was moderate at $\eta = 0.29$, further supporting the relationship between supply and amount used. Thus, supply of liquid rather than container size appears to influence the amount poured.

Contrasts support these conclusions. When supply is held constant, usage did not differ significantly for the two container sizes (see Table 1). Subjects used more liquid when they had a lot (1,000 milliliters) than for lesser amounts (500 milliliters) ($F(1,74) = 6.86$, $p < .01$, $\eta = 0.29$). However, they used more when they had a small supply (250 milliliters) than when they had a moderate supply on hand (500 milliliters) ($F(1,74) = 7.43$, $p < .01$, $\eta = 0.30$).

Discussion

The results show that supply but not container influenced product usage. Offering the product in a large container did not, in itself, increase the amount poured over the smaller container. Nor did the fill level (the relationship between supply and container) influence usage. For example, consumers were similarly influenced by the supply in a half-empty large bottle and a full small bottle (Table 1).

The lack of dependence on the container in judging supply is consistent with research examining Piaget's conservation of quantity principle (e.g., Piaget 1983). Piaget notes that young children gradually acquire the ability to assess quantities independent of the container shape and size. Consider the judgment required when viewing the same amount of lemonade being poured from a tall, thin glass to a short, fat glass. Whereas young children do not perceive equivalent lemonade supplies in the two glasses because they are perceptually dependent on the container's shape, adults are able to assess visually the quantity of liquid while ignoring the container.

The supply on hand did influence usage but not in a manner consistent with scarcity theory. Increased usage from the moderate supply (500-milliliter condition) to the small supply (250-milliliter condition) is inconsistent with the notion that consumers place more value on products available in scarce quantities and so use less of them. However, increased usage might be explained by assuming that consumers find scarce products more attractive and so want to use more of them. On the other hand, increased usage based on enhanced attractiveness of scarce products is inconsistent with the decline in usage from the large supply (1,000 milliliters) to the moderate supply (500-milliliters condition).

Although the pattern of results rules out an explanation derived from scarcity research, the results could be explained by hypothesizing both a contrast effect and an assimilation effect. When context (supply) is greatly discrepant from a stimulus (the range of amounts deemed effective), a contrast effect occurs (Helson 1964). A large supply leads consumers to use more, so that the amount poured does not seem so small. As the supply diminishes, the perceived contrast would also

decline so less would be used. One might expect a leveling off of amount used as consumers began to consider the lack of benefit of using too little.

However, at some point the supply would be depleted so that assimilation rather than contrast might occur; the supply and the acceptable range of amounts to be used would be perceived as similar (Sherif and Hovland 1961). Assimilation might lead subjects to pour more for low levels of the supply, perhaps explaining the pattern found in study 1 (see Table 1).

At any rate, the more important issue is not whether there is assimilation at the lowest levels of product supply but whether usage decreases with supply. The decline in usage from the large to the intermediate supply is consistent with this hypothesis. Varying more amounts would provide greater support for this relationship.

STUDY 2

A second study attempted to replicate the finding that consumers conserve diminishing resources and test its generality across differing amounts of the product from those used in experiment 1. Consumers should use more of a product when the container is two-thirds full (667 milliliters) than when one-third full (333 milliliters). The one-third-full supply is so discrepant from the largest amount poured (148 milliliters) that assimilation seems unlikely. Study 1 found no container-size effects, so this variable was not manipulated in study 2.

Method

The same procedures were followed as in study 1. Subjects were 30 employees (22 females, eight males) at a different university from that sampled in study 1, one located in a mountainous region of the central United States. Sampling from a different subject pool helped to ensure that participants would be naive as to the purpose of the study.

Only three people who were approached and asked to participate claimed never to have cleaned a toilet and so were not tested. The remaining consumers were asked to pour the amount of cleaner they would use into a container. Half (15 people) were given the large container filled to two-thirds and the other half were given a one-third-full large container. After completing the task, participants were systematically questioned about how they decided how much to use. A different interviewer was used from study 1.

Results and Discussion

Respondents poured significantly more cleaner when the container was two-thirds full than when it was one-third full ($F(1,29) = 13.36$, $p < .001$, $\eta = 0.56$; see Table 1). Thus, the decline in usage is not dependent on the size of the supply manipulated in study 1 (1,000 milliliters and 500 milliliters) but extends to other amounts. Taken together with the results of study 1, this suggests that the amount used declines with supply until a very low supply is reached (around 250 milliliters for this product), at which point the amount increases dramatically. Although one might be tempted to compare specific amounts across studies 1 and 2 and make inferences about the shape of the usage curve, it should be noted that such comparisons are inappropriate. The studies used subjects from different regions of the United States with possibly different types of cleaning problems (e.g., because of water composition differences) and different interviewers.

Despite the clear results supporting a supply effect, subjects did not spontaneously report that the amount available influenced their usage. When asked how they decided on the quantity to use, no one mentioned anything related to the supply. The most common response (from 77 percent of the participants) was that they emulated pouring the liquid toilet bowl cleaner just as they would at home. When debriefed about the purpose of the study, almost all subjects agreed that they typically curbed their usage of products as the supply declined, often volunteering anecdotes describing such practices. Thus, the notion rang true but was not mentioned by any subjects until specifically asked about it. Other research also finds that the context is not explicitly recognized and is sometimes even denied as influencing one's judgment (e.g., Herr, Sherman, and Fazio 1983; Nisbett and Wilson 1977; Northcraft and Neale 1987). Tversky and Kahneman (1981) have maintained that directly questioning subjects as to what factors guide their behavior is unlikely to detect context effects.

STUDY 3

Study 3 examined usage when the supply could not be visually assessed. Studies 1 and 2 indicate that usage decisions are made within the context of the supply available; more is used with a large supply than with a small supply. However, the transparent bottles made supply easy to assess. Visual cues of supply would seem to be an important element if a contrast effect accounts for reduced usage. When an opaque container prevents visual assessment of amounts, the supply effect might be eliminated.

Alternatively, when containers are opaque, consumers may use bottle size as a heuristic for the supply available. A large container would imply a larger supply than a small container, so usage would be greater from a large container than from a small container. For example, consumers would use more bleach from a large container containing 16 ounces of liquid than from a small container with the same amount. In sum, although study 1 shows that container does not influence perceived effectiveness or usage when the supply can be visually assessed, container may be a cue for supply when the amount is difficult to appraise.

Method

The same procedures were followed as in study 1. Subjects were 44 employees (32 females, 12 males) at the same university as in study 1, although a different interviewer was used. To ensure that participants would be naive as to the purpose of the study, subjects were sampled from a different part of the campus. Further, data were collected more than a year and a half after study 1.

Consumers were asked to pour the amount of cleaner they would use into a receptacle. Two containers were used, with the larger having twice the capacity of the smaller. A third of the subjects (15 people) were given the large container filled to two-thirds, another third were given the large container filled to one-third and the remainder (14) were given a two-thirds-full small container. Thus, the supply was greater in the two-thirds-full large-container condition but equivalent in the one-third-full large-container condition and the two-thirds-full small-container condition. The bottles were similar in shape to each other and to those used previously. However, the bottles' dark brown color made it impossible for subjects to observe the supply inside.

Results and Discussion

Consistent with study 1 results, container size had no effect on usage ($F(2,41) = .31$, NS, $\eta = 0.10$). Although the direction of the means is consistent with a supply effect (see Table 1), a trend analysis shows no significant difference in amount poured between the larger and the smaller supply ($F(1,43) = .50$, NS, $\eta = 0.11$). Thus, neither supply nor container size influenced usage when the bottles were opaque. This result suggests that consumers do not shift from one salient reference point (supply) to another (container) but are selective in the context within which they make their usage judgments. Research in psychophysics has found similar behavior when making judgments of the heaviness of weights (Brown 1953).

It appears that decreasing usage with a diminishing supply occurs only when the supply is visually prominent. The trend of the means suggests that error in assessing accurately the bottle's contents could have contributed to the lack of a significant effect. Subjects may have found it difficult to assess their supply when relying only on the bottle's weight as a cue, leading to greater variance in amount poured than in the previous studies. However, the standard deviations in study 3 were not too discrepant from those in studies 1 and 2 (see Table 1).

Study 3 findings may be limited to inexperienced users of the product. As a user develops experience with a product the consumer might become less dependent on visual cues to assess supply; the consumer acquires a more accurate memory of the weights of various product supplies. For example, the experienced liquid detergent user may more easily assess degrees of supply despite an opaque bottle.

STUDY 4

Study 3 indicates that visual cues may be necessary for supply to influence usage in that no significant effect was found when the bottle was opaque. Study 4 examines whether static visual cues are sufficient for a supply effect by presenting subjects with only a picture of the amount available. Thus, the bottle's weight and the dynamic visual cue from pouring the liquid could not influence usage. If the contrast between the supply and the amount to be used accounts for the supply effect, pouring the liquid should not be necessary for differences to emerge.

Another difference is that instructions were given that specified the amount of the product that should be used. Perhaps subjects in the previous experiments used the supply as a cue for usage because other information was absent. If so, the supply effect should not emerge when consumers are provided with usage instructions (e.g., use an amount the size of a quarter).

An additional change is that a more elaborate attempt to examine perceptions of supply was undertaken by systematically collecting thought listings and obtaining rating-scale evaluations. Past research suggests that scarce products are inferred to be more valuable products (Worchel et al. 1975) and so could account for miserly behavior. To examine this possible link between supply and perceived product value, study 4 also presented subjects with various amounts of a product and asked them to indicate the value they placed on the product.

Similar to study 1, perceptions of product potency and dilution were expected to be similar across amounts. Finally, a different product was used to increase confidence in the effect's generality.

Method

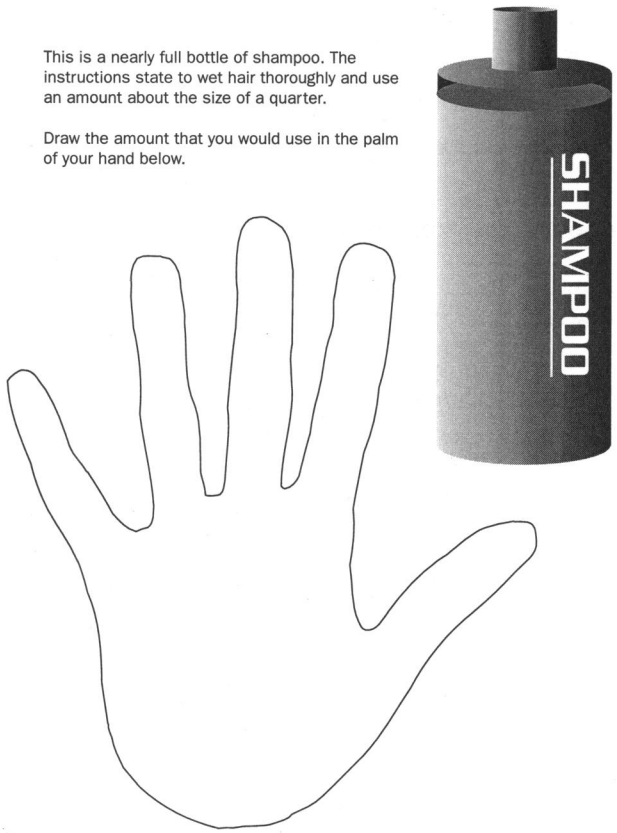
Two separate studies were conducted, the main usage study and a supplementary study.

Usage Study. Subjects were 60 undergraduate business majors (32 females and 28 males). They were given a one-page questionnaire that had a picture of either a nearly full ($n = 28$) or a half-full bottle of shampoo ($n = 32$). Subjects were told that "the instructions state to wet hair thoroughly and use an amount about the size of a quarter." Alongside the bottle of shampoo was an outline of an open hand (see Figure 1).

Subjects were told to draw the amount of shampoo that they would use in the palm of the open hand. Similar to the likely conditions when subjects use shampoo, no outside aid in determining the size was permitted (i.e., students were not allowed to trace the outline of an actual quarter). Then they were asked to indicate on a seven-point scale the thickness of their hair (1 = very

FIGURE 1

INSTRUCTIONS FOR STUDY 4



thin, 7 = very thick). The usage measure was devised because discussions with a comparable sample of students indicated that the procedure would have a degree of realism. Most reported applying shampoo by first pouring an amount similar to a quarter in the palms of their hands. A separate group of 23 students were asked merely to draw a quarter on a blank piece of paper.

Supplemental Study. In an attempt to shed light on the underlying cognitions involved in the usage decisions, another group of 76 students were asked about their perceptions of the bottles. The same bottle picture and instructions were given to the students (25 saw the nearly full bottle and 26 saw the half-full bottle). In addition 25 subjects were shown the same shampoo bottle filled to one-fourth. Then two open-ended questions were posed in which students were to write down the thoughts that came to mind when looking at the bottle of shampoo and when reading the instructions.

A classification system was devised to code the open-ended answers. Two judges blind to the hypotheses and conditions categorized the responses with disagreements resolved by two other judges. Over a third of the subjects (37 percent) mentioned a thought about supply in response to either of the two questions, but only two subjects were from the full condition and the remainder were about equally divided between the quarter-full and half-full conditions. Most subjects merely restated the amount (e.g., "one half-full bottle," "it's almost empty") rather than relate supply to usage. Only 7 percent of the subjects specified the need to replenish the supply (e.g., "soon I'll have to get some more," "this will last a long time"), mostly in the one-quarter-full condition. Thus, the thought listings provided little insight into the relationship between supply and usage.

The most common thought about the bottle, mentioned by 76 percent of the subjects, related to the container itself (e.g., "modern bottle," "a clear bottle"). Other thoughts related to the shampoo (e.g., "a salon type," "cheap") (49 percent of subjects). The frequencies of these types of thoughts were similar across conditions. The most common thought about instructions related to the amount of shampoo to use (e.g., "amount is not enough for my hair," "if I use more will it hurt my hair?") (65 percent of subjects), followed by commentary about the instructions not related to amount (e.g., "do you lather your hair until suds appear?" "does it have conditioner?").

The general similarities across conditions in the thought listings were also found in the rating-scale results. After completing the open-ended questions, subjects indicated their impressions of the shampoo bottles on 13 seven-point rating scales (similar to the methodology used in many scarcity studies). The product was rated as one that they would/would not use, better/worse than other shampoos, valuable/not valuable, effective/not effective, expensive/cheap, ordinary/special, good/bad, strong/weak, poor/good quality, thick/watery, an inferior/superior product, diluted/concentrated, and precious/not precious. Subjects were then asked to "estimate what you think a bottle of this shampoo would sell for at the store." For all measures the means were similar. Contrasts conducted among the three conditions were not significant.

Results

In regard to the usage data, we conducted a two-way ANOVA using the amount in the bottle and sex of subject as independent variables and thickness of the hair as a covariate. The dependent measure was the circumference of the amount that the subjects drew on the outline of the open hand. More was used when the shampoo bottle was full than when it was half-full ($\bar{X}$ = 140 millimeters vs. 106 millimeters, $F(1,59) = 8.89$, $p < .005$, $\eta = 0.36$). Women used more than men ($F(1,59) = 3.84$, $p < .06$, $\eta = 0.34$). The interaction between sex and bottle size was not significant, nor was hair thickness a significant covariate.

A significantly larger circumference was drawn in the half-full condition compared with that when subjects were merely asked to draw a quarter ($\bar{X}$ = 106 vs. 92 millimeters, $F(1,82) = 10.98$, $p < .005$, $\eta = 0.34$). Thus,

subjects choose to exceed the specified amount since they *can* follow instructions when they wish (i.e., when asked to draw a quarter). Further, consumers indicate less wasteful usage with the half-full bottle compared with the full bottle rather than underusing the product.

Discussion

Consistent with the previous experiments, consumers reported using less of the product as the supply diminished. However, decreased usage does not appear to occur because the product in the half-filled-bottle condition is perceived as stronger or more concentrated (consistent with study 1 results for product effectiveness). Nor is less used because the product is considered more valuable or precious, as would be suggested by the scarcity literature (e.g., Worchel et al. 1975).

The methodology used in this study sheds some light on the point at which supply influences usage decisions. Because the effect was found when subjects merely observed the bottle, it appears that the decision of how much of the product to use occurs before the product is poured from the container. In other words, consumers do not decide to use a fixed amount and then become stingier as they pour it out and view the product diminishing before their eyes. Observation of the supply appears to be a necessary and sufficient condition to influence usage.

Although the results are consistent with what would be expected on the basis of a contrast effect, it may seem surprising that the amount to be used varied even when an absolute standard (the quarter) was provided. Yet, consumers may often deviate from instructions, believing that using more will have better effects (Folkes and Martin 1993). Subjects may have used the quarter as a starting point or anchor for their judgments, then adjusted upward, both anticipating a better effect and contrasting that amount with the supply available.

STUDY 5

The goal in study 5 was to increase our confidence in the generality of the findings by examining a situation in which the amount used has direct consequences for the consumer. Differences in usage in studies 1, 2, and 4 may have occurred because the amount poured lacked a personal impact. In study 5, the effect of supply was tested in an actual usage situation and in a field setting. Subjects were graduate students who applied laundry detergent to their own possessions when varying supplies of the product were available. This is an increase in realism from the preceding studies, as well as avoiding possible confounds present in studies testing usage through pantry checks.

Method

Graduate students living in campus housing were recruited for this study. An interviewer sat outside of the communal laundry room waiting for residents to bring their laundry to be washed. The interviewer was also a graduate student and was seated inconspicuously at a desk with some reading material. As an individual entered the laundry room the interviewer asked the resident to participate in a marketing study concerning laundry detergents. Subjects were told that a new brand of powdered, concentrated detergent that contained no bleach, dyes, or perfumes was being test marketed. They were informed that if they answered a short survey they would be given a sample of the detergent. This cover story was used so that students would not guess the true purpose of the experiment.

The 39 individuals who agreed to participate were told to go about doing their usual laundry sorting in the washers. Along with the transparent bottle of detergent they were also given a measuring cup which they could use if they so desired. The desired "fill line" was clearly marked on the cup, consistent with the typical packaging for laundry detergents. The vast majority (30 subjects) used the cup, six did not, and for three subjects the cup usage was not recorded by mistake. Immediately after the detergent was poured into the first load, the experimenter took the bottle away from the student and went into another room. The remaining contents of the bottle were weighed out of the subject's sight and then were returned to the subject.

Attached to the bottle was a postcard with several questions about laundry practices (e.g., the typical number of loads washed). One question asked subjects to evaluate the cleaning effectiveness of the detergent on a nine-point scale, anchored by 1 = not at all effective and 9 = very effective. Subjects were told to mail the questionnaire once they had completely finished the bottle of detergent. The main purpose of the postcard questionnaire was to lend credibility to the cover story.

The subjects were randomly assigned to either a full-bottle (large supply, $\bar{X}$ = 38.67 ounces), two-thirds-full (medium supply, $\bar{X}$ = 24.82 ounces), or one-third-full (small supply, $\bar{X}$ = 12.72 ounces) condition, with 13 people in each condition. Subjects were run individually so that others could not observe the experimental procedures. Although some bottles were not completely full, all bottles were new. To reinforce the notion that the bottles were not "used," all were sealed with a type of "tamper-proof" cap commonly used by manufacturers. Each bottle was weighed before it was given to a subject, with the amount remaining after usage subtracted from the supply to arrive at the dependent measure.

Results and Discussion

Consistent with study 2 results, subjects used less of the product when the bottle was one-third full than when it was two-thirds full ($\bar{X}$ = 2.3 ounces vs. 3.0 ounces, $F(1,38) = 3.86$, $p < .05$, $\eta = 0.30$). However, subjects used about the same amount of detergent when

the bottle was two-thirds full and when it was full ($\bar{X}$ = 3.0 ounces for both). Thus, there is mixed support for the notion that consumers conserve usage as their supply diminishes. It seems likely that the lack of difference between the two-thirds-full and full-bottle condition is due to a ceiling effect on the tendency to use more with more ample supplies. At some point, the lack of benefit or increased risk of bad effects from using too much detergent must be considered, which may override the perception of increasing contrast.

Taking into consideration that a measuring cup was used, the disparity between the one-third-full and larger-supply conditions may seem surprising. However, the perceived effectiveness of various amounts of a product depends on the difficulty of the task (Folkes and Martin 1993). Data consistent with this notion come from the postcard questionnaire, which asked subjects whether they typically adjusted for the amount of detergent depending on how large the load was and how dirty it was. Most of the 24 subjects who returned the postcards reported they typically varied the amount used (88 percent for size of load and 67 percent for soil). Further, the interviewer observed that 86 percent of the subjects adjusted the machine's water level to reflect different sizes of wash loads, so similar adjustment of detergent amount is not surprising.

Consistent with the findings of studies 1 and 4, initial supply appears unrelated to perceived effectiveness after usage. Of the 39 subjects, 24 (62 percent) returned the postcard (eight in the full condition, nine in the two-thirds-full condition, seven in the one-third-full condition). Effectiveness ratings for the detergent were similar across conditions ($\bar{X}$ = 4.2, 3.7, and 4.1 in the full, two-thirds, and one-third conditions, respectively).

If supply, which is irrelevant to the judged effectiveness of the product, influences usage, then consumers are wasting their money (in the case of overuse) or not achieving the best effects (in the case of underuse). Subjects used about 30 percent more in the large- and moderate-supply conditions than was deemed sufficient in the small-supply condition. Further, the mean amount used in the small-supply condition was greater than that recommended by the fill level of the measuring cup (2.3 ounces vs. 2.1 ounces). In study 4, the mean amount allocated was greater than the recommended quarter size in the large- and small-supply conditions. In study 1, assuming that the smallest amount poured was deemed sufficient to do the job (87 milliliters), subjects poured almost twice as much of the product than was necessary (146 milliliters in the full-large-bottle condition).

In sum, study 5 results lend support to the supply effects found in the previous studies; subjects actually used the product on their possessions, in contrast to studies 1–4. Thus, allocating too little or too much would have personal consequences for them. Further, whereas subjects in studies 1–4 were not allowed to rely on a measuring implement to follow instructions, most study 5 subjects took advantage of the provided measuring cup to allocate the amount to be used. This suggests the supply effect does not arise merely because subjects made usage decisions in an informational vacuum.

GENERAL DISCUSSION

This series of experiments suggests that available supply influences the amount consumed on single-usage occasions. The generality of this finding is strengthened by demonstrating it with different subject populations, various household products, diverse settings, and different procedures. Yet, some limits on the supply effect have emerged from the research. A necessary and sufficient condition for supply to influence usage appears to be that the amount available be visually assessable. Additionally, upper and lower bounds may hold for the effect, such that above a certain level consumers do not increase their usage and below a certain level consumers use more instead of less.

Decreasing usage as the supply diminishes appears to be due to a contrast effect with consumers making usage decisions before pouring the amount when they assess the supply visually. Consideration of the supply available may be a rather habitual behavior that is interrupted only when costs associated with overuse are also salient. These costs could include risks from overuse, a product that is expensive to obtain, and others. However, the product itself is not perceived as more effective or valuable as a consequence of decreasing supply.

There are several possible explanations for why the research presented here failed to replicate previous findings of enhanced value placed on scarce supplies. Finding that scarce products are perceived to cost more occurs only when the price of the commodity is unknown and when consumers are primed to consider the product's expense (Lynn 1989). The products examined in studies 1–5 are known to be relatively inexpensive. Also, scarcity experiments are generally described to subjects as consumer preference or attitude studies, so price and value may be more salient than in the research presented here. For example, in the Worchel et al. (1975) cookie study, an array of products were displayed in a "consumer preference study" and subjects were asked to taste test the cookies. In the research presented here subjects were given the product or told to use the product as if it were theirs. The endowment literature suggests that owning a product does not influence consumers' liking for it (as suggested by scarcity research) but does induce a dislike for giving it up (Kahneman 1992). This reluctance to part with products may extend even to situations in which subjects simulate ownership (e.g., as with studies 1–4) and when a benefit is received from usage. At any rate, the scarcity literature has not demonstrated that scarcity and actual usage are linked.

Another possible explanation for the effect of supply on usage is that replenishment costs become more sa-

lient as the supply dwindles so consumers use less to delay restocking. (This explanation also assumes that subjects in the studies presented here behaved as if they actually owned the product or at least had a strong learned predisposition to anticipate replenishment costs when viewing the declining supply.) However, aversion to replenishment is incompatible with increased usage for the small supply (study 1).

In sum, a perceptual contrast effect appears to provide the best explanation for the effect of supply on usage. This is not to say that other factors would not influence usage in other contexts. For example, the scarcity literature suggests that competition with others for products influences usage (Worchel et al. 1975), which could have practical implications for understanding consumption within households.

IMPLICATIONS FOR FUTURE RESEARCH

Whereas the results of the series of experiments presented here provide consistent evidence that supply influences usage, they also raise issues that require additional research to clarify. These include (1) how people assess product supply, (2) whether consumers underuse products or overuse products in response to various supplies, and (3) whether marketplace activities that increase the amount of products sold also influence usage.

Assessing Product Supply

Little is known about how consumers assess their supplies of products. Systematic errors in perceiving one's supply can be expected, as when false bottoms and other forms of deceptive packaging lead to overestimates. With technological advances in creating lighter materials and concentrated forms of products, underestimating a container's amount may be a common error. For example, a 16-ounce box of detergent in concentrated form may suggest a smaller supply compared with a 32-ounce box of diluted detergent, even though cleaning power is equivalent.

Although the direction of error when assessing one's supply is fairly obvious in the case of deceptive packaging and concentrated products, problems in judging supply are more complex when amounts are partitioned into separate containers. The cognitive effort in mentally combining amounts from multiple containers of possibly disparate shapes and sizes to arrive at a total supply can be considerable and so hinder assessment (e.g., compare the amount in a six-pack with that in a single bottle). The effect of multiple containers on assessment is also complicated by potential container size effects (e.g., single-serving sizes may convey norms about usage). Further, opening new containers is associated with rewards (e.g., a fresher product) and costs (e.g., finding a bottle opener) that influence usage independent of supply effects. For example, a consumer might accelerate usage when he or she has a small supply left in order to use more quickly a new, fresher bottle.

The research presented here focuses on visual assessment of supply, but it may be that simply knowing the size of one's supply is sufficient to elicit the effect. An important issue is examining the effect of mental representations of one's supply as opposed to perceptual salience of supply. The research presented here is only a first step in investigating how consumers assess supply.

Overuse of Products

Although the research presented here suggests that consumers use more than they need to at least some of the time, this research cannot conclusively say that consumers are wasting products when supplies are abundant. Overuse is an important issue in an era of increased awareness of the earth's limited resources. Wasting resources, along with littering, depletion of the ozone, and other environmentally damaging behaviors, often seems rather inconsequential when examined on an individual level because it is the cumulative impact of numerous actions from many consumers that causes harm. If the perception of abundance increases consumption even slightly, this would suggest one means of preventing wasteful practices that might have an impact over many individuals and usage occasions.

Conservation might be more likely when an individual's supply is low and the amount is visually assessed. For example, to encourage drivers to conserve gasoline, the government might limit the number of gallons one may purchase (as was common during the energy crisis) and require manufacturers to make gasoline gauges more visually prominent. If drivers were more alert to depletion of their gas tanks, they might make fewer discretionary trips, accelerate more gently, and moderate their driving speed. In contrast, topping off one's tank probably focuses attention on a plentiful supply and is likely to encourage waste. Awareness of supply effects may help policymakers develop programs to encourage consumers to conserve other natural resources (e.g., reducing usage of water and disposable paper products).

The Relationship between Quantity Purchased and Quantity Used

Another important issue is understanding the link between quantity purchased and quantity used. Many marketplace practices are oriented toward increasing the volume the individual consumer buys. The consequences for individual usage are unclear. Volume purchases may have the effect of increasing the number of usage occasions or increasing the amount of product disposed of but not consumed. It may also increase the amount consumed on individual usage occasions by increasing the supply on hand. A tendency to use more with greater supplies suggests that marketplace practices

that encourage the purchase of large amounts might also influence usage. Thus, marketing strategies that increase the quantity of sales, such as the scheduling of promotions to accelerate purchase cycles, quantity promotions (e.g., offering additional product for the regular price), and bulk-purchasing outlets (e.g., warehouse buying clubs), might all increase usage by increasing the individual's supply on hand.

[*Received July 1992. Revised April 1993.*]

REFERENCES

Blattberg, Robert C., Thomas Buesing, Peter Peacock, and Subrata K. Sen (1978), "Identifying the Deal Prone Segment," *Journal of Marketing Research,* 15 (August), 369–377.

Brown, Donald Robert (1953), "Stimulus-Similarity and the Anchoring of Subjective Scales," *American Journal of Psychology,* 66 (April), 199–214.

Folkes, Valerie and Ingrid Martin (1993), "Product Usage Decisions When Instructions and Task Magnitude Vary," working paper, Department of Marketing, University of Southern California, Los Angeles, CA 90089-1421.

Helson, Harry (1964), *Adaptation Level Theory,* New York: Harper & Row.

Herr, Paul, Steven J. Sherman, and Russell H. Fazio (1983), "On the Consequences of Priming: Assimilation and Contrast," *Journal of Experimental Social Psychology,* 19 (July), 323–340.

Jenkins, James J. (1979), "Four Points to Remember: A Tetrahedral Model of Memory Experiments," in *Levels of Processing in Human Memory,* ed. Laird S. Cermak and Fergus I. M. Craik, Hillsdale, NJ: Erlbaum, 429–446.

Kahneman, Daniel (1992), "Reference Points, Anchors, Norms and Mixed Feelings," *Organizational Behavior and Human Decision Processes,* 51 (March), 296–312.

Lynn, Michael (1989), "Scarcity Effects on Desirability: Mediated by Assumed Expensiveness?" *Journal of Economic Psychology,* 10 (June), 257–274.

——— (1991), "Scarcity Effects on Value: A Quantitative Review of the Commodity Theory Literature," *Psychology and Marketing,* 8 (Spring), 43–57.

Nisbett, Richard E. and Timothy D. Wilson (1977), "Telling More than We Can Know," *Psychological Review,* 84 (May), 231–259.

Northcraft, George B. and Margaret A. Neale (1987), "Experts, Amateurs, and Real Estate: An Anchoring-and-Adjustment Perspective on Property Pricing Decisions," *Organizational Behavior and Human Decision Processes,* 39 (February), 228–341.

Piaget, Jean (1983), "Piaget's Theory," in *Handbook of Child Psychology,* ed. Paul H. Mussen, New York: Wiley, 103–128.

Raj, S. P., Richard Staelin, and Andrew A. Mitchell (1977), "A General Procedure for Measuring the Effect of Promotions on Buyer Behavior," *American Statistical Association Proceedings,* 72, 112–116.

Sherif, Muzafer and Carl D. Hovland (1961), *Social Judgment: Assimilation and Contrast Effects in Communication and Attitude Change,* New Haven, CT: Yale University Press.

Tversky, Amos and Daniel Kahneman (1981), "The Framing of Decisions and the Psychology of Choice," *Science,* 211 (January), 453–458.

Worchel, Stephen, Jerry Lee, and Akanbi Adewole (1975), "Effects of Supply and Demand on Ratings of Object Value," *Journal of Personality and Social Psychology,* 32 (May), 906–914.